Remarks

Reconsideration of the subject application is requested in view of the foregoing amendments and the following remarks.

Applicants appreciate the search performed by the examiner in the course of examining the pending claims.

The amendments on pages 2 and 5 of the specification are to correct readily discernible grammatical errors. The amendment to page 10 of the specification is to clarify that the girders are not resolved by the FIA optical system, even though this is discernible by other text in the paragraph and in the paragraph preceding it. The amendment to page 19 of the specification is to correct a readily discernible error in diction. No new matter is submitted.

Claims 1-30 are pending. In this paper, independent claims 1, 8, and 21 are amended; all other claims are unchanged.

Claim 1 is amended to move certain text from the preamble to the body of the claim.

Claim 1 also is amended to state specifically that the alignment-mark pattern is exposed onto the substrate using a single exposure shot of the charged particle beam and that the resulting alignment mark as imprinted on the substrate by the charged particle beam includes the girders resolved between the respective pattern-element portions. See, for example, specification page 9, line 24, to page 10, line 3; page 11, lines 19-22; page 12, lines 14-17; page 13, lines 6-9; page 14, line 23 to page 15, lines 2 and 17-19; page 19, lines 1-7.

Claim 8 is amended in a manner resulting in moving around of certain text in the claim as filed. Claim 8 also is amended in certain ways that are similar to the amendments made to claim 1.

Claim 21 is amended in certain ways that are similar to the amendments made to claim 1.

Claims 1, 8, and 21 also are amended to state that, even though the girders (in the alignment mark imprinted on the substrate using the charged particle beam) are resolved between the respective pattern-element portions, the girders are not resolvable by the optical-based alignment-detection device. See specification, page 9, line 24 to page 10, line 3.

Claims 1-6, 8, 11-14, and 16-20 stand amended under 35 U.S.C. § 102(b) for alleged anticipation by Nakasuji. This rejection is traversed.

Independent claims 1 and 8 require that the alignment-mark pattern be configured for lithographic exposure from the reticle to a sensitized substrate using a single exposure shot of a charged particle beam. The resulting alignment mark as imprinted on the substrate by the charged particle beam includes the girders resolved between the respective pattern-element portions. The alignment mark on the substrate is detectable using an optical-based alignment-detection device, but the girders are not resolvable by the optical-based alignment-detection device. As discussed in on page 9, line 24 to page 10, line 3 of the specification:

> On the substrate, if the alignment-mark girders formed by splitting the pattern elements on the reticle are too large, then there is a risk that the suitability of the corresponding alignment mark for high-accuracy position detection (e.g., by FIA) will be compromised. In such an instance, the pattern elements can be split in a manner such as in the alignment-mark pattern 21 of FIG. 1(B), in which the pattern elements 21_H, 21_V are divided into respective pattern-element portions separated from each other by thin girders 21_G. Desirably, on the substrate, each alignment-mark girder has a line width that is finer than the resolution limit of the FIA optical system used for alignment-mark detection. Thus, measurement accuracy by FIA is not compromised.

Hence, according to the subject claims as amended, the girders are sufficiently small so as not to be resolvable by the optical-based alignment-detection device.

The Office action refers to FIGS. 3(B) or 3(C) of Nakasuji as allegedly depicting alignment-mark elements. This is incorrect. The depicted features are elements of a circuit pattern, not of an alignment-mark pattern. Col. 3, lines 34-35; Col. 7, lines 6-22. Consequently, concerns regarding alignment-mark patterns are not addressed in Nakasuji, which certainly does not address the problems articulated in page 2, line 26 to page 4, line 12 of the instant specification. Also, because the pattern elements (items 32 as shown in FIG. 3(A) of Nakasuji) are divided into respective complementary portions shown in FIGS. 3(B) and 3(C) of Nakasuji, more than one exposure shot of a charged particle beam is required to expose those pattern elements, col. 7, lines 10-19, not a single shot as required by the subject claims. In addition, after exposing the respective portions shown in FIGS. 3(B)-3(C) of Nakasuji onto the substrate, the spaces (such as the spaces 39B referred to in the Office action) between pattern-element portions are eliminated and hence not resolvable under any circumstances or using any means.

Compare FIG. 3(A) with FIGS. 3(B)-3(C). Thus, after exposure of the portions shown in FIGS. 3(B)-3(C), no girders are left (and no girders are resolved) between portions of pattern elements as imprinted on the substrate (wherein a "girder" is a membrane portion extending between pattern-element portions; see page 9, lines 22-23 of the instant specification). Furthermore, because the pattern elements shown and discussed in Nakasuji are elements of a circuit pattern and not of an alignment mark, there is no requirement or suggestion in Nakasuji that the pattern elements, as exposed onto the substrate, be detectable by an optical-based alignment-detection device, and no requirement or suggestion in Nakasuji that girders remain between pattern-element portions as imprinted on the substrate that are not resolvable by the optical-based alignment-detection device.

Therefore, none of the subject claims is anticipated by or obvious from Nakasuji. Withdrawal of the rejection is proper and hereby requested.

Claims 7, 9-10, 15, and 21-30 stand rejected for alleged obviousness from Nakasuji. This rejection is traversed.

Claim 7 depends from claim 1 and is properly allowable over Nakasuji for all the reasons discussed above regarding claim 1. Claims 9-10 and 15 depend from claim 8 and are properly allowable over Nakasuji for all the reasons discussed above regarding claim 8. Independent claim 21 as amended, although a method claim, has many recitations that are similar to corresponding recitations in claims 1 and 8. Hence, claim 21 and its dependents are properly allowable over Nakasuji for all the reasons discussed above pertaining to claims 1 and 8.

Regarding claims 7 and 15, the Office action admits that "Nakasuji does not specifically disclose the width of the girders as claimed." Applicants agree. However, Applicants disagree with the Office action's contention that "providing alignment marks that are less than a resolution limit of an alignment detection unit is well known." First, the Office action provided no evidence in support of this contention. Second, providing such alignment marks would not be known (and certainly not "well known") from Nakasuji because Nakasuji is concerned not with alignment marks but rather with complementary portions of circuit pattern elements that require multiple exposures for complete imaging onto the substrate.

Regarding claims 9 and 10, the Office action admits that "Nakasuji does not specifically disclose a pattern device [pattern] in addition to the mark." This is misplaced. As discussed above, Nakasuji is concerned with portions of elements of circuit patterns, not with alignment marks. Hence, Nakasuji does not disclose alignment marks in addition to pattern elements.

Regarding claims 21-30, the Office action admits that "Nakasuji does not specifically disclose detecting the mark as an alignment mark and to determine alignment." Applicants agree, and additionally state that Nakasuji does not discuss alignment marks at all or their detection. Even though the Office action contended that "alignment detection in exposure devices are [sic; is] well known," this contention (if true) would be insufficient to bridge the gap between Nakasuji and the instant claims.

Therefore, the subject claims are properly allowable over Nakasuji.

In view of the foregoing, the pending claims as amended are properly allowable, and early action to such end is requested.

Respectfully submitted,

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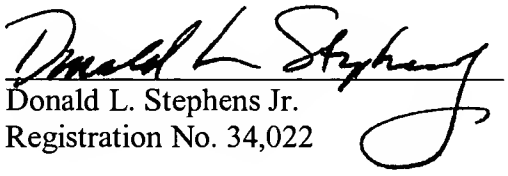
By 
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